MATH 435: DYNAMICAL SYSTEMS

SPRING 2016

Course Information:

- **Instructor**: Dr. Zhenghe Zhang, zzhang@rice.edu
- **Office**: Herman Brown Hall (HBH) 426
- **Class meeting**: 1:00PM–2:15PM, TR, (location TBA)
- **Office hour**: Wed 5-6PM, or by appointment
- **Texts**: *Differential Equations, Dynamical Systems, and an Introduction to Chaos.* (3rd Edition), Morris W. Hirsch, Stephen Smale, and Robert L. Devaney.
- **Class Website**: Look for **CAAM/MATH 435 001 Sp16** on Owlspace

Prerequisites: MATH 211, MATH 212, CAAM 335 OR MATH 355, and MATH 302 or MATH 321. (Notice that MATH 211 is not officially listed. But it will actually be more helpful than other courses listed since we will begin with ODEs.)

Course Description:

Dynamical systems originated from (though go far beyond) differential equations, which were mostly from Celestial Mechanics. Unlike in MATH 211 where we aim for solving ODEs explicitly, dynamical systems is more of a qualitative flavor. It deals with systems of all trajectories generated by a system of ODEs (geometrically, the phase space), and the goal is to understand their long-term behaviors. In the late 19th and early 20th centuries, great mathematicians like Henri Poincaré realized that the qualitative analysis is the more appropriate way to study most ODEs. Over more than a hundred years, it's now a very well-developed area in math.

I will begin with the classification of the system of 2 homogeneous linear DEs where linear algebra is quite involved. Then step by step, I will introduce some basic notations and techniques of dynamical systems. Examples related to physics and biology will be introduced along

with these notions and techniques. Eventually, as the title of our textbook indicated, I hope I will be able to introduce some basic examples where we may see some chaotic dynamical behaviors.

Exam and Grades:

There will be a midterm exam and a final exam. All are take-home and pledged.

Homework:

Homework will be assigned on Owlspace and be collected in class probably every other week (mostly, at the beginning of Monday's class). You are encouraged to work together on homework. You must write and understand your own solution. **No late homework will be accepted once due time is indicated.**

Participation & Attendance:

Attendance will be very important in this class, though not reqired. I expect students to attend every class and arrive on time. Moreover, It is your responsibility to keep informed of all the announcements and materials covered during class. While Owlspace is an important resource, not all announcements will be posted there.

Disability Support:

If you have a documented disability that will affect your work in this class, please contact me within the first week to discuss accommodations. Students with disabilities will also need to contact disability support center.

Disclaimer:

The instructor reserves the right to make changes to this syllabus without prior notice. However, once changes are made you will be notified of those changes.